

equity; use of that equity cost would produce an overall cost of capital between 12.68% and 12.99%. He believed, however, that an analysis of telecommunications companies generally would understate the forward-looking cost of equity, inasmuch as their stock prices had been bid up in anticipation of mergers while growth forecasts failed to reflect the cost savings and revenue growth potential associated with those mergers.

To determine the capital structure, Dr. Vander Wiede examined three groups of companies: the S&P Industrials, firms that offer local exchange service, and interexchange carriers. He found that the capital structure for all three sets of companies typically contained no more than 20% debt and no less than 80% equity, confirming the conservative nature of the range of capital structures he recommended. For further confirmation, he analyzed local exchange companies earnings before interest, taxes, depreciation, and amortization in order to estimate the market value capital structure of Verizon's stand alone local exchange operations; that analysis showed capital structure containing from 18% to 21% debt and 82% to 79% equity.

In the First Proceeding the Commission adopted a capital structure comprising 40% debt and 60% equity. Dr. Vander Wiede regarded that as insufficiently forward-looking (embodying only small movement from the historical capital structure of 45% debt/55% equity) and as failing to represent the capital structure of firms operating in a competitive environment.

Finally, Dr. Vander Wiede calculated a cost of debt of 7.77%, based on the average yield to maturity of Moody's A-Rated Industrial Bonds for December 1999.

#### AT&T's Presentation

AT&T argues that the capital intensive nature of local telephone service makes the cost of capital an important part of overall costs under TELRIC and that Verizon's inflated cost of capital will deter competition, encourage inefficient construction of bypass facilities by entrants, and generate

subsidies for the incumbent's business. It asserts that "by asking the Commission to assume a competitive market where one does not exist, Verizon is actually trying to ensure that such a market will never exist."<sup>148</sup> AT&T's witness Hirshleifer estimated a weighted average cost of capital for Verizon in the range of 9.17% to 9.91%, premised on an equity cost of 10.42%, a debt cost of 7.86%, and capital structures ranging from 54% debt/46% equity to 20% debt/80% equity.

To estimate Verizon's cost of equity, Mr. Hirshleifer applied a three-growth-stage DCF analysis to a proxy group comprising the remaining regional Bell holding companies and the larger independent telephone companies. He regarded that sample as comparable to Verizon and believed the market information related to them already reflected the onset of competition, which had long been expected by investors. Given that the overall risk associated with those companies exceeds the risk of supplying UNEs alone, AT&T regards the resulting cost of equity as conservatively high.<sup>149</sup>

AT&T used a cost of debt of 7.86%. It sees no significant difference on that point from Verizon, noting that both parties' estimates may be conservatively high in their omission of short-term debt and their reference to Verizon's operations overall rather than the less risky provision of UNEs alone.<sup>150</sup>

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<sup>148</sup> AT&T's Reply Brief, p. 37.

<sup>149</sup> Mr. Hirshleifer also presented a capital asset pricing model (CAPM) analysis, averaging its result with that of his DCF analysis. Verizon's initial brief challenges the CAPM in various ways and AT&T's reply brief defends it against those attacks, but AT&T's own initial brief mentions it only once (at p. 143), to note without elaboration that Mr. Hirshleifer relied on it as well as on his DCF analysis. Given that posture of the parties and the Commission's historical reluctance to rely on the CAPM to estimate the cost of capital, I will not discuss the CAPM further.

<sup>150</sup> AT&T's Initial Brief, pp. 144-145.

With respect to capital structure, AT&T noted that, in general, the greater the degree of operating risk faced by a company, the greater the proportion of equity in its capital structure. It maintains that the unreasonably high level of risk contemplated by Verizon's witness led him to assume a capital structure incorporating too much equity. Mr. Hirshleifer suggested a broad range of capital structures, ranging from 54% debt/46% equity to 20% debt/80% equity. Using the midpoint of that range together with Verizon's cost of equity would reduce Verizon's calculated cost of capital to 12.16%.

#### Arguments

AT&T begins its analysis with ¶702 of the Local Competition Order, in which the FCC concluded that the

currently authorized rate of return at the federal or state level is a reasonable starting point for TELRIC calculations, and incumbent LECs bear the burden of demonstrating with specificity that the business risks that they face in providing unbundled network elements and interconnection services would justify a different risk adjusted cost of capital or depreciation rate. These elements generally are bottleneck, monopoly services that do not now face significant competition.

Mr. Hirshleifer's analysis emphasized this monopoly nature, and AT&T disputes Verizon's premise that its cost of capital should be set as if it were a player in a fully competitive market. It notes in this regard a statement by Verizon's own consultants that TELRIC requires an assumption that "(1) the ILEC will effectively be a monopolist in the provision of network elements for the indefinite future and (2) competitors will need to obtain such elements to compete over this timeframe."<sup>151</sup>

AT&T goes on to argue that ¶702 imposes on Verizon the burden of demonstrating the need for a different risk adjusted cost of capital. It notes as well that ¶702 concludes with the

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<sup>151</sup> AT&T's Initial Brief, p. 141, citing Exhibit 408, p. 4.

observation that the "risk adjusted cost of capital need not be uniform for all elements," and contends that Verizon's witness failed to recognize any distinction between the risk faced by Verizon in providing monopoly wholesale telephone services--the inquiry here--and the greater risk it faces in providing its competitive telephone services including far flung business ventures encompassing wireless service and investments overseas. AT&T claims that its witness Hirshleifer took account of these factors in concluding "that a risk-adjusted cost of capital for the lines of business at issue in this proceeding is undoubtedly less than Verizon's overall cost of capital based on its entire range of business activities."<sup>152</sup>

In advocating a three-stage growth model, AT&T disparages Verizon's "analytically easy but completely unreasonable assumption that a firm's present growth rate will remain constant indefinitely. Such an assumption," AT&T continues, "would mean that a firm growing at a rate in excess of the annual growth in GDP would eventually subsume the entire U.S. economy."<sup>153</sup> It contends that its three-stage growth model is consistent with the "almost universally accepted principle that multi-stage models should be used when evaluating companies whose growth rate exceeds that of the economy as a whole."<sup>154</sup> Mr. Hirshleifer assumes high growth during the first five years, above-average but decreasing growth for the ensuing 15 years, and growth tracking the economy as a whole thereafter. Noting that a constant growth model applied to AT&T's proxy group of companies would increase the cost of equity by 379 basis points, AT&T contends that proponents of a single-stage model must assume, unreasonably, that the sample companies will maintain growth rates higher than the economy as a whole forever and that their stock prices will not rise to reflect that growth.

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<sup>152</sup> AT&T's Initial Brief, p. 143.

<sup>153</sup> Id., p. 146.

<sup>154</sup> Id.

With regard to choice of proxy group, AT&T maintains that Dr. Vander Wiede's use of the S&P Industrials rests entirely on the premise that TELRIC assumes vigorous competition but thereby conflicts with the FCC's premise that UNEs are a bottleneck monopoly service. Beyond that, the S&P Industrials comprise a very broad group of companies facing risks and opportunities far different from those confronted by Verizon or other telecommunications companies and, in AT&T's view, Verizon's witness showed no similarity between Verizon and those companies, making only "the unreasonable and speculative assumption that the advent of competition will make local providers such as Verizon as risky as the S&P Industrials."<sup>155</sup> Mr. Hirshleifer's proxy sample, in contrast, is more nearly comparable to Verizon. The unreasonably high level of risk contemplated by Verizon's witness likewise caused him to assume a capital structure incorporating too much equity.

In sum, AT&T maintains that Verizon has simply not carried its burden of proving that its business risks entitle it to the rate of return it seeks.

Verizon regards AT&T's 9.54% cost of capital as unreasonable, noting that it is below the cost of capital figure that AT&T used in 1997 in making its own investment decisions<sup>156</sup>; below the 11.25% cost of capital that the FCC found to be a reasonable starting point for TELRIC calculations<sup>157</sup>; and below the 10.2% figure that the Commission adopted in the First Network Elements Proceeding. Given the increased competition in New York, Verizon regards these reductions in the cost of capital as unreasonable. More specifically, it sees no basis for Mr. Hirshleifer's premise that Verizon enjoys monopoly power in the provision of UNEs, citing competitive developments in New

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<sup>155</sup> Id., p. 150.

<sup>156</sup> The AT&T figure, and, accordingly, the spread between the two figures, are proprietary.

<sup>157</sup> Local Competition Order, ¶702.

York State and alleging Mr. Hirshleifer's lack of familiarity with them.<sup>158</sup>

With specific reference to capital structure, Verizon disputes Mr. Hirshleifer's reference to book value capital structure (55% debt/45% equity), contending that book value capital structures are irrelevant to determining forward-looking costs. (AT&T denies using book value, explaining that Mr. Hirshleifer reflected the lower risk of the network element leasing business by choosing a capital structure at the midpoint between the market value and book value capital structures of telephone holding companies.)

Verizon disputes as well the proxy group of companies analyzed by Mr. Hirshleifer, contending that the sample size was too small, encompassing only four telecommunications companies; that all telecommunications companies are merger targets, rendering their market data unreliable for DCF purposes; and that holding companies of the sort analyzed by Mr. Hirshleifer are less risky, not more so, than the business of offering UNEs, given the holding companies' ability to diversify, to take advantage of economies of scope and scale, and to have greater access to capital markets. Meanwhile, while Verizon may face less competition than the S&P Industrials, it faces greater risk from high leverage, technological change, and regulatory policy.

Verizon goes on to note that in the First Proceeding the Commission rejected the three-growth DCF model, seeing no reason to depart from the traditionally used single-stage model. It maintains as well that Mr. Hirshleifer's DCF analysis fails to reflect the fact that dividends are paid quarterly, as did Dr. Vander Weide, nor does it provide for recovery of flotation costs. (AT&T responds that flotation costs need not be added, inasmuch as they are already accounted for the price of a company's stock, and that, in any event, Verizon has issued little stock in the past five years and appears unlikely to undertake large equity financings soon. It likewise sees no

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<sup>158</sup> Verizon's Initial Brief, pp. 91-95.

need to reflect quarterly dividend payments, contending it would provide Verizon the benefit of both quarterly and monthly compounding.<sup>159</sup>)

Finally, Verizon argues that AT&T's proposed cost of capital fails to pass the test of reasonableness. Noting again that AT&T used a higher cost of capital in making its own investment decisions, it contends that AT&T has an economic interest in estimating that cost of capital as accurately as possible. It argues as well that Mr. Hirshleifer's DCF method, applied to other companies, unreasonably suggests that riskier companies had lower costs of equity than less risky companies, and it disputes Mr. Hirshleifer's efforts in his rebuttal testimony, to challenge the analyses that lead to those inferences.<sup>160</sup>

WorldCom and the CLEC Alliance support AT&T's cost of capital estimate, offering substantially similar arguments. WorldCom points to the frequent rejection by regulators in other jurisdictions of Verizon's competitive market assumption and emphasizes its view that Verizon remains a monopoly provider of network elements with no effective competition in the wholesale market. The CLEC Alliance similarly argues that the development of competition in the retail local exchange markets, which Verizon cites to support its assumption, has no relevance to the risk faced by a firm engaged solely in providing access to local exchange facilities at wholesale. It contends that Dr. Vander Weide's method is identical to the one rejected by the Commission in the First Elements Proceeding and that his result is compromised by the lower estimates issued by Verizon's management in connection with its recent mergers; it disputes Verizon's effort to distinguish those estimates on the basis of the purposes they are intended to serve.

Finally, the Federal Agencies advocate a capital structure of 40% debt and 60% equity, as used in the First

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<sup>159</sup> AT&T's Reply Brief, pp. 54-56.

<sup>160</sup> Verizon's Initial Brief, pp. 103-106.

Proceeding. They contend the less leveraged capital structure advocated by Verizon is merely a fictional target at least for the foreseeable future, and that to shift its capital structure to that extent, Verizon would have to retire billions of dollars of debt or issue billions of dollars of equity capital. They cite in this regard the stable nature of Verizon's capital structure over the past decade and, like the CLECs, recommend a capital structure based on Verizon's books rather than a market-based structure, given Verizon's virtual monopoly in the relevant market. They add that the unreasonably high equity component in Verizon's capital structure results in an unnecessarily high allowance for income taxes.

#### Discussion and Conclusion

The Commission's decision in the First Elements Proceeding, which considered the issues posed here, can serve well as the starting point for analysis. With respect, first, to risk profile, the Commission (referring to predecessor corporations) said:

New York Telephone greatly strains the FCC's forward-looking concept in taking it as warrant for regarding NYNEX as comparable, for cost of capital purposes, to certain industrial firms operating in different, if fully competitive markets. One can recognize the consequences of competition in telecommunications without concluding that NYNEX will operate in the same environment and face the same risks as the S&P Industrials.

AT&T's proxy group, meanwhile, uses a group of telecommunications firms whose capital costs reflect the lower risks associated with regulation, along with the market's recognition of the onset of competition in areas traditionally seen as monopolies. The resulting figures provide a reasonable starting point for estimating NYNEX's own capital costs, since it, too, is a firm whose traditional monopoly lines of business are being opened to competition. But this starting point must be adjusted to reflect a change in NYNEX's risk profile. Accordingly, we will use AT&T's proxy group to calculate the DCF-based cost of equity (which already reflects the market's judgments regarding the effects of competition on the proxy



group companies). The historical debt/equity ratio, however, will be modified, from 45%/55% to 40%/60%, in order to bring it, and the resulting overall cost of capital, within the range of those that might characterize a communications firm such as NYNEX operating in a competitive environment we are endeavoring to promote.<sup>161</sup>

These observations are no less pertinent today than when first made. Verizon correctly argues that TELRIC should not be understood to contemplate a "fantasy network" that makes use of speculative technology. But neither should it be taken to require basing the cost of capital on a "fantasy marketplace," in which the provision of local telephone service is as competitive as the sale of detergent. Such a market is our goal; together with federal regulators we are fostering it; and significant progress in that direction has been made. But one cannot realistically claim that the goal will be reached with respect to local service within the next few years. With respect to UNEs, vibrant competition seems even more remote; indeed, were it achieved, there would be no need for regulators to require TELRIC pricing in the first place. Accordingly, for the reasons noted by the Commission above, I recommend use of AT&T's proxy group to determine the cost of equity. To recognize continued movement toward a competitive market, however, the capital structure should be further modified to 35% debt/65% equity.

With regard to quarterly dividends and flotation costs, the Commission rejected, "as unnecessary and contrary to precedent," Verizon's proposed treatment:

With respect to quarterly dividends, see e.g., Case 28947, The Brooklyn Union Gas Company - Rates, Opinion No. 85-15 (issued September 26, 1985), p. 52 (adjustments such as this are "unnecessarily complex refinements"). More specifically, the effects of quarterly dividend payments need not be recognized inasmuch as investors can reinvest dividends themselves and do not regard the proceeds of doing so as part of their expected return. As for flotation

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<sup>161</sup> Phase 1 Opinion, pp. 38-39.

costs, see e.g., Case 28947, New York Telephone Company - Rates, Opinion No. 85-17 (issued October 11, 1985), pp. 196-198 (denying flotation costs in the absence of clear evidence of contemplated stock issuance).<sup>162</sup>

Those observations remain valid. Verizon's present arguments regarding flotation costs were rejected in the Phase 1 Rehearing Opinion,<sup>163</sup> and its further claims with respect to quarterly dividends have been refuted by AT&T's witness.<sup>164</sup> There is no need to modify the result otherwise reached to account for these factors.

Finally, with respect to the multi-growth DCF method, the Commission said:

. . . we have traditionally used, in rate cases, a single-growth model (or, on occasion, a two-growth model), and AT&T has shown no need to depart from that practice here. To be sure, a firm maintaining an above-average growth rate in perpetuity would, as an arithmetic truism, eventually consume the entire economy; but that absurd theoretical result has not precluded use of an above-average single growth rate in the past<sup>165</sup> and need not be of any greater practical concern here. Among other things, New York Telephone properly notes that stock repurchases reduce growth in total dollar earnings, and its witness Vander Weide pointed out that dividends more than 20 to 25 years out have little effect on a firm's stock price and that use of a single-stage, above average growth factor requires assuming only that above-average growth can be sustained for 20 or 25 years.<sup>166</sup>

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<sup>162</sup> Id., p. 40, n. 2.

<sup>163</sup> Phase 1 Rehearing Opinion, pp. 66-67.

<sup>164</sup> Tr. 2,250-2,251.

<sup>165</sup> E.g., Case 90-G-0734, National Fuel Gas Distribution Corporation - Rates, Opinion No. 91-16 (issued July 19, 1991) (growth factor of 6.1%, Gross Domestic Product growth of 2.8%) (footnote in original).

<sup>166</sup> Phase 1 Opinion, pp. 39-40.

AT&T's arguments in the present case resemble in many ways those in the First Proceeding, and there continues to be no basis for rejecting the single-growth model and adopting a three-growth model as a matter of principle or theory. But the Commission in Phase 1 noted that it had, on occasion, employed a two-growth DCF analysis, and the unusual circumstances--primarily, a one-growth figure that seems attributable to particular conditions and very likely unsustainable--that warranted recourse to it (or to some other alternative) appear to exist here as well.<sup>167</sup>

Using the AT&T proxy group with updated data would suggest, under a one-growth DCF model, a return on equity of 14.77%--almost the same as the return Verizon calculated on the basis of its own proxy group. The figure comprises a dividend yield of 2.45% (measured as of March 30, 2001) and a growth rate of 12.32% (based on I/B/E/S growth rate as of March 15, 2001). Several factors suggest that result is unreliable and out-of-line, incorporating a growth rate that will not be sustained.

For one thing, the equity return calculated in the First Proceeding, 12.1%, exceeded the cost of debt calculated there (7.3%) by 4.8 percentage points. The present cost of debt (measured, as in Phase 1, as the average of Moody's composite rate for Aa rated debt and S&P's composite rate for A rated debt as of April 3, 2001) is 7.39%, and a 14.77 equity cost would

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<sup>167</sup> For example, the Commission spoke favorably of a two-growth DCF in Case 28211, Consolidated Edison Company of New York Inc. - Electric Rates, Opinion No. 83-7 (issued March 9, 1983); in view of anticipated substantial changes in that company's payout ratio, it used a one-growth DCF that had been adjusted to reflect those factors. In Case 29327, Niagara Mohawk Power Corporation - Electric and Electric Street Lighting Rates, Opinion No. 87-3 (issued March 13, 1987), it used a two-growth DCF in view of the "transitional" changes in that company's financial position, related to bringing on line a large, long-term construction project. See also Case Central Hudson gas and Electric Corporation - Electric Rates, Opinion No. 86-18 (issued July 17, 1986).

exceed that figure by 7.38 percentage points. There is no explanation for so substantial an increase in equity risk premium, and it calls the calculated equity return seriously into question. Beyond that, there are several factors that could account for an extraordinarily high growth factor in the short run, among them the growth of wireless and data/internet and international services. These are unlikely to continue to sustain the growth factor in this way, and some remedial adjustment seems warranted.

Several alternatives present themselves. A three-growth DCF, applied to the AT&T proxy group, using the I/B/E/S growth rates for the first five years, an average of that growth rate and AT&T's alleged sustainable growth rate (6.29%) for the ensuing 15 years, and the sustainable growth rate thereafter produces an average equity cost of 10.30%. A two-stage analysis, using the sustainable rate after the first five years, produces an average cost of 9.26%. These figures appear unduly low, particularly when compared to a broadbased average calculated in the Merrill Lynch Quantitative Profiles analysis, using a three-stage growth model. The April 2001 edition of that document calculated a DCF return of 11.2% for both the S&P 500 and for a group of 29 telecommunications companies.

In view of these widely divergent estimates and the ongoing major changes in the industry that may account for them, it seems to me that a fair and conservative result can be obtained by applying to the current cost of debt the same equity risk premium that emerged in the First Proceeding. The cost of debt, as noted, is now 7.39%, and the equity risk premium in the First Proceeding was 4.8 percentage points. That suggests a cost of equity in this proceeding of 12.19%, a figure well within the range supportable by the record as a whole. The resulting overall cost of capital, using a debt/equity ratio of 35%/65%, comes to 10.5%, as shown in the following table:

	<u>Percentage</u>	<u>Cost</u>	<u>Weighted Cost</u>
Debt	35%	7.39%	2.6%

Equity	<u>65%</u>	12.19%	<u>7.9%</u>
Total	<u>100%</u>		<u>10.5%</u>

#### LOOP COSTS

##### Introduction and Overall Method

Verizon submitted studies of the costs of providing unbundled access to two- and four-wire analog loops and two- and four-wire digital loops.<sup>168</sup> Its cost studies claim to assume a fully forward-looking design based on next generation digital loop carrier (DLC) technology, supported by fiber optic feeder cable, even though DLC is nowhere near universal deployment. Among other things, DLC provides for the conversion of analog signals into digital format in a remote terminal (RT) located in the outside plant, allowing for the direct delivery of digital line signals to digital line switch ports. Verizon maintains this configuration is always less costly than one that terminates an analog signal at the switch, assuming costs are analyzed by taking account of the loop/switch combination as a whole and not from the perspective of the loop alone. According to Verizon, "comparing loop costs, without reference to switching costs, is a fallacy that undermines most CLEC analysis of the relative costs of all-copper loops and fiber-fed DLC-

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<sup>168</sup> According to Verizon, "a two-wire analog loop is a transmission circuit consisting of two wires that is used to both send and receive voice conversation in the 300-3000 Hz frequency range. This is the basic loop type used for providing voice-grade 'POTS' service. A four-wire analog loop consists of two pairs, one to transmit and one to receive. It is used in certain private line and data service applications. A two-wire digital loop is a two-wire loop suitable for the transmission of certain high-speed data services. In particular, Verizon's two-wire digital ('premium') loop can be used to provide ISDN - Basic Rate interface ('BRI') service to an end-user customer. A four-wire digital loop will support DS1-level transmission. It can be used, among other things, to provide ISDN - Primary Rate Interface ('PRI') service to an end-user customer. (Tr. 2,421-22.)" Verizon's Initial Brief, pp. 108-109, n. 247.

equipped loops at short lengths."<sup>169</sup> Verizon cites in this regard the Commission's endorsement, in the First Elements Proceeding, of a 100% fiber feeder/DLC configuration, and it continues to regard that premise as consistent with TELRIC.

Verizon's loop architecture also assumes the use of forward-looking GR-303 technology, which, among other things, permits a smaller number of switch ports to serve a given number of POTS loops.<sup>170</sup> Nevertheless, Verizon's studies consider not only the "integrated" DS1 level GR-303 interface but also a more costly DS0 level "universal" (non-GR-303) interface. This use of universal DLC (ULDC) interfaces rather than integrated DLC (IDLC) is controversial and is discussed below.

Along with the foregoing technology assumptions, Verizon's study posited use of existing outside plant routes and lengths, on the premise that they are driven by factors, such as geography and local land-use requirements, that will not change in a forward-looking environment. It then determined the equipment that would be deployed along those routes by randomly selecting 55 wire centers (representing all three of its proposed density zones) and asking its outside plant engineers to develop a forward-looking design for each of the 242 feeder routes within those wire centers. It explains that "the engineers were asked to assume current customer and central

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<sup>169</sup> Id., p. 112.

<sup>170</sup> The initially analog signal appears at the switch port as a DS0 digital channel (a voice-grade digital channel, i.e., a digital channel of the lowest capacity), having been converted to that format at the remote terminal. There is, however, no DS0-level loop/switch interface, and DS0s are grouped as a 24-channel DS1 for interconnection. The GR-303 interface group comprises up to 28 DS1 channel groups interconnecting a remote terminal and a switch, and it obviates a one-to-one association of switch ports and loops by taking advantage of the fact that only some customers will be requesting service at any given time and establishing a connection between a DS0 channel and a loop only when the customer picks up the phone. That phenomenon is referred to as "concentration." (Verizon's Initial Brief, p. 115.)

office locations, and current routing of feeder cable, but otherwise to develop designs that were in no way constrained by the current, 'embedded' deployment of facilities. In this way, Verizon insured that the loop design underlying its studies would be fully forward-looking."<sup>171</sup> In determining the quantities of equipment to be deployed, Verizon made assumptions regarding utilization factors, and it applied what came to be called an "environmental factor," said to take account of zone-specific differences in the amount of work required to install outside plant. Finally, it developed a "link cost calculator" that costs out the facilities designed by the outside plant engineers.

Each step of Verizon's analysis drew criticism from other parties, as next discussed. Issues related specifically to digital subscriber loops (DSL) are discussed in a separate section.

#### Network Design

##### 1. Loop Configuration; Fiber vs. Copper

A major source of controversy in the First Elements Proceeding was Verizon's assumption of 100% fiber optic feeder; other parties argued, in general, that for relatively short loops (various cut-off points were identified) copper feeder would be less expensive, and the Hatfield Model contemplated its use. The Commission ultimately determined to use the 100% fiber feeder network, finding that when installation and maintenance, among other things, were taken into account, fiber offered cost and operational advantages that warranted its use even for relatively short narrow band loops.<sup>172</sup> In the present proceeding, there is general (though not universal) agreement that all-fiber feeder is the technology of choice as long as it is deployed in a manner that maximizes its advantages; but several CLEC parties deny that Verizon has done so.

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<sup>171</sup> Verizon's Initial Brief, pp. 118-119.

<sup>172</sup> Phase 1 Opinion, pp. 82-84; Phase 1 Rehearing Opinion, pp. 22-29.

WorldCom offers an extended critique of Verizon's loop configuration, distinguishing between the high-density Manhattan zone and less dense regions. In Manhattan, Verizon assumes either a remote terminal located in the customer's building, served by fiber directly to the building (84% of total lines) or else an outside remote terminal, with a copper subfeeder from the RT to the distribution interface (16% of lines). According to WorldCom, an additional alternative would be an RT located in the central office itself; for loops under 4,000 feet, in situations where the RT cannot be located in the customer's building, WorldCom believes a central office RT would be less costly than an outside RT, "simply because the typical outside RT configuration always involves RT site location costs."<sup>173</sup> Although the average loop line in Manhattan is 2,700 feet, Verizon shows no lines served by an RT in the central office, and WorldCom alleges that it therefore overstates the cost of the forward-looking network.

Turning to other areas of the State, WorldCom contends that Verizon ignored the fundamental engineering principle, recognized in its own engineering guidelines, that fiber-fed RTs should be located at a "location that minimizes the copper cable's length leaving the RT site to the customer premises."<sup>174</sup> It contends that Verizon simply assumed that feeder and distribution lengths would be the same as in the existing embedded plant. While Verizon asserts that its engineers designed the forward-looking network free of existing constraints, it nevertheless acknowledges that the feeder and distribution lengths reported in the loop model were the same as in the existing plant.<sup>175</sup> WorldCom recommends what it characterizes as a conservative 10% downward adjustment of loop costs to recognize these inefficiencies.

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<sup>173</sup> WorldCom's Initial Brief, p. 44.

<sup>174</sup> Id., p. 45, citing Exhibit 445 (WCOM-VZ-120 §5).

<sup>175</sup> Id., p. 46, citing Tr. 2,418-2,419.



WorldCom contends as well that Verizon's loop cost model improperly assumes that each central office terminal (COT) serves only two RTs--a "dual-feed" arrangement--when in fact its engineering guidelines specify that more RTs could be deployed to maximize utilization of the COT.<sup>176</sup> It argues that compliance with this guideline would increase COT utilization and reduce COT installation costs per line, and it suggests adoption of a COT fill factor of 90% to correct the flaw.<sup>177</sup> Finally, WorldCom contends that Verizon fails to reflect optimal DLC line concentration, in that it assumes a 3:1 concentration ratio even though its "network planners highlight that the architecture and features of the GR-303 system include variable line concentration as high as 6:1," a figure endorsed by Verizon's economic and network planning studies.<sup>178</sup> WorldCom calculated that use of a 6:1 concentration ratio would reduce DS1 channel unit costs from \$3.90 per circuit to \$1.95. It asserts that the traffic engineering blockage concerns cited by Verizon as requiring the 3:1 ratio have not been shown to be anything other than attributable to inefficiencies in the legacy network.

The CLEC Alliance contends that Verizon's failure to take full advantage of the alleged efficiencies of an all-fiber/DLC feeder architecture warrants reconsideration of the Commission's previous determination to posit its use. It contends that Verizon's own numbers show that an all-copper loop construct would yield lower total loop costs and that the use of fiber should be limited to loops longer than the cross-over point at which the use of fiber feeder begins to lower the cost of the entire loop. It asserts that Verizon's own network planning guides provide for the use of copper for distances under 4,000 feet.

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<sup>176</sup> WorldCom's Initial Brief, p. 47, citing Exhibit 445 (WCOM-VZ-120 §5.3).

<sup>177</sup> Fill factors are discussed below.

<sup>178</sup> WorldCom's Initial Brief, p. 48, citing Exhibit 414P.

The CLEC Alliance argues as well, like WorldCom, that Verizon has failed to take advantage, in a TELRIC compliant manner, of the efficiencies offered by fiber, such as by placing RTs closer to end users and maximizing the length of the fiber feeder sub loop. It charges that Verizon "uses copper where fiber should be used because of the length of the distribution loop, and it uses all fiber to the curb of large buildings where the entire loop is less than 1,000 feet."<sup>179</sup> The CLEC Alliance adds that Verizon, in response to an argument that it used too little fiber cable relative to copper cable, analyzed a wire center--Albany State Street--that by its own admission was anomalous.<sup>180</sup>

Verizon responds to these various critiques. To WorldCom's point about RT placement in Manhattan, it explains that the cost of outside RTs is avoided in the 84% of instances in which the RT is located inside the customer's building. In the remaining 16% of instances, the possibility of placing the RT in the central office rather than outside is implicitly taken into account though not identified as a separate model.<sup>181</sup> It disputes as well the broader charge, by both WorldCom and the CLEC Alliance, that it failed to take full advantage of fiber/DLC technology, contending that RT placement was based on forward-looking feeder design. It asserts that the overall ratio of fiber feeder length to copper subfeeder and distribution length is an efficient 4:1, not the lower figure erroneously calculated by WorldCom witness Dr. Ankum on the basis of a small, non-representative sample of loops.

Verizon defends as well its 3:1 concentration ratio. It argues that too high a ratio entails an unacceptable risk that a call will be blocked; that its engineers determined that 3:1 was the maximum recommended ratio; that the 6:1 ratio referred to in its planning document was, in effect, a straw man

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<sup>179</sup> CLEC Alliance's Initial Brief, p. 77.

<sup>180</sup> Id., p. 78.

<sup>181</sup> Verizon's Reply Brief, p. 68.

used for analysis rather than a guideline that took account of traffic considerations;<sup>182</sup> and that WorldCom has shown neither that a higher ratio would be acceptable nor that the need to keep the ratio at 3:1 results from inefficiencies associated with the embedded network rather than customer calling patterns. It likewise supports its premise of two RTs to each COT, contending that its guideline does not specifically recommend multiple rather than dual feed and that additional costs and operational difficulties may be associated with the multiple feed option. It therefore contends that "in practice, multiple RT arrangements are only used where grossly inefficient underutilization of COTs would otherwise occur."<sup>183</sup>

Finally, Verizon disputes the CLEC Alliance's argument for the use of copper in short loops, arguing, among other things, that the CLEC Alliance failed to recognize, in its cost comparison, the fixed costs of terminating copper loops on digital switches. It asserts as well that the CLEC Alliance misread the Verizon engineering guideline it cited as supporting the use of copper.

While these issues are novel in their content, they are classic in their form. In effect, a utility is estimating its costs on the basis of its experience and projecting those costs to the future in a manner intended to take account of forward-looking developments. (The forward-looking premise is applied more aggressively under TELRIC than under traditional forecast test years, but in a manner not fundamentally different in form.) The utility's data and experience are a good source of information on what can be expected in the future, but the utility has a clear self-interest in erring on the side of high cost forecasts. For both reasons, it bears the burden of proof, and the regulator must ensure that only proven costs are allowed. In so doing, the regulator should avoid groundless speculation or what Verizon characterizes as "the Panglossian

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<sup>182</sup> Verizon's Initial Brief, p. 116, n. 264.

<sup>183</sup> Verizon's Reply Brief, p. 76.

perspective of the CLECs, who seem to believe that all difficulties will magically dissolve in a sufficiently 'forward-looking' environment."<sup>184</sup> But where a range of estimates is suggested by the record, regulators have always made reasonable adjustments that impel a utility to seek efficiencies, just as it would be impelled to do by a competitive market.

Against that background, I conclude that Verizon has, for the most part, successfully defended its network design. There is certainly no basis for revisiting the Commission's decision that an all-fiber-feeder, DLC construct represents the least-cost, most efficient, forward-looking network, nor do I see any need to modify Verizon's assumptions with respect to the placement of RTs. But the record suggests a range of reasonable options with respect to concentration ratio and the number of RTs to each COT. As to the former, Verizon has not borne its burden of proving that a 3:1 concentration ratio is the absolute maximum, though it does seem likely that a concentration ratio as high as 6:1 could imperil adequate service--and not merely because of alleged inefficiencies in the legacy network. To ensure that prices are set on the basis of a reasonable, least-cost premise, I recommend use of a concentration ratio of 4:1. Likewise, Verizon has not shown that more than two RTs per COT would be unacceptable, though it has identified costs and risks that may be associated with a higher ratio. The record overall suggests not a specific adjustment here, but recognition of this concern in the choice of a fill factor, as discussed below.

## 2. Integrated vs. Universal DLC

As already noted, Verizon studied two alternative loop/switch interfaces: the integrated DS1 level interface and the universal DS0 level interface. The latter is more expensive, but Verizon maintains its use is dictated in some circumstances by service choices made by the CLEC. Several CLECs dispute that premise.

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<sup>184</sup> Id., p. 75.

Verizon maintains that a CLEC wishing to take advantage of the efficiencies offered by a DS1 (that is, 24-loop) interconnection may do so, but that a CLEC wishing to connect only a single loop instead of purchasing an entire DS1 level interface has no alternative but to use the UDLC mechanism, in which a voice grade analog signal is transmitted over a copper facility and is then converted on the COT into a DS0 channel that can be delivered to the digital switch. Verizon recognizes that this connection is less efficient but maintains it is the only available way to connect an individual two- or four-wire analog loop or two-wire digital loop to the NGDLC system. In its view, the choice between the two types of interconnection is up to the CLEC.

WorldCom charges that Verizon's claim ignores the recently developed ability of GR-303 IDLC systems to achieve DS0 unbundling, permitting a DS0 interconnection without a universal interface. It charges that UDLC is "an outmoded, high-cost embedded technology that has no role in a forward-looking TELRIC network."<sup>185</sup> It points to the Commission's rejection, in a compliance phase of the First Proceeding, of Verizon's effort to show that ISDN-BRI loops could not be connected using integrated technology, and it maintains that Verizon has similarly failed to make a showing of infeasibility here. AT&T argues similarly, accusing Verizon of giving lip service to TELRIC while in fact reverting to embedded cost recovery principals. The CLEC Alliance adds that Verizon uses IDLC to provide loops to its own retail customers and that to deny it to interconnecting CLECs is discriminatory. It emphasizes the widespread nature of IDLC deployment and identifies the operational as well as the cost disadvantages of UDLC. Rhythms/Covad take Verizon to task for "posit[ing] a forward-looking, TELRIC-compliant network using IDLC loops and then develop[ing] UDLC rates that ignore that technology."<sup>186</sup>

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<sup>185</sup> WorldCom's Initial Brief, p. 41, citing Tr. 1,419-1,421; 3,738.

<sup>186</sup> Rhythms/Covad's Initial Brief, p. 6.

In response, Verizon maintains that the technological innovations said to permit use of an IDLC interface for individual voice-grade loops cannot, in fact, do so efficiently and that a CLEC that sought to provision a loop in this manner would still incur the costs of a full DS1-level interface. It contends that the CLECs are not asking for "an integrated interface as such"; "rather they are seeking a rate that recognizes the efficiencies of such an interface, without paying the high unit costs associated with providing that interface for less than a DS1's worth of loops."<sup>187</sup>

The CLEC argue credibly that GR-303 technology should be able to obviate UDLC in the near future if it cannot already do so, and that a properly forward-looking TELRIC analysis should take account of those developments. But it appears as well that the capacity may not yet be available, and that its timing is less than certain. In these circumstances, WorldCom's reference to the process used in the First Proceeding is particularly apt. Rates should now be set on the basis of UDLC connections in the situations where Verizon proposes to do so, but they should be adjusted downward one year from now, to reflect IDLC connections, unless Verizon can show that it would be unreasonable to make that adjustment.<sup>188</sup>

#### Survey Method

AT&T offers several criticisms of the survey in which Verizon asked its plant engineers to redesign a sampling of feeder routes. It contends that the responses are hearsay; that they were "scrubbed"<sup>189</sup> by managers; that the sample data may not be representative; and that the analysis simply represents subjective determinations by the outside plant designers. AT&T contrasts Verizon's study of only 10.6% of its wire centers and

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<sup>187</sup> Verizon's Reply Brief, p. 72.

<sup>188</sup> To clarify, I recommend that the adjustment be made one year from the date of this recommended decision, not one year from the date of the Commission's action in the proceeding.

<sup>189</sup> AT&T's Initial Brief, p. 30.

11.7% of its feeder routes with the HAI study's analysis of all of Verizon's service territory. AT&T charges further that the study was rushed; that it contains numerous simplifying assumptions that generated homogeneous data; and that the study inconsistently suggests that average loop component lengths always sum to the maximum loop length. The CLEC Alliance offers similar arguments, adding that Verizon's engineers have an incentive to overstate costs--for the sake of conservatism as well as to enhance Verizon's position--and arguing that survey evidence typically is admissible as an exception to the hearsay rule only if the survey is "material, more probative on the issue than other evidence and if it has guarantees of trustworthiness."<sup>190</sup> In the absence of such considerations here, it says, Verizon has not borne its burden of proof.

Verizon replies that the subjectivity of its study means that "it is grounded in the informed expert judgment of human engineers who are actually familiar with and responsible for [the] routes [in question]" and that such subjectivity "is superior to the supposed 'objectivity' (and factual invalidity) of the HAI Model."<sup>191</sup> It adds that the HAI Model itself uses judgment as justification for its inputs and algorithms. It asserts that the sum of the average lengths of its loop components was, in fact, equal to the average loop length, that the surveys were not rushed but conducted over a period of many months without pressured deadlines, and that the data entries for feeder routes were homogenous simply because the survey form was designed to obtain the data at the wire center level, not the feeder route level. Verizon sees no source of bias in the survey, noting that the participants had no responsibility for UNE rates and arguing that they had nothing to gain by overstating requirements. While the surveyed engineers were not witnesses, the individuals who designed and administered the survey were available for cross-examination.

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<sup>190</sup> CLEC Alliance's Initial Brief, p. 68, citing cases.

<sup>191</sup> Verizon's Reply Brief, pp. 76-77.

I see no systemic flaw in the survey process. I have already recommended that the Commission find an analysis that starts from Verizon's own information to be acceptable--indeed, preferable to one grounded more in abstractions--and Verizon's survey was a reasonable way to gather the needed information.<sup>192</sup> Likewise, I find no evidence of deliberate bias in the manner in which the study was conducted. Of course, one strength of the study--its reliance on the expert opinion of Verizon's experienced engineers--is simultaneously a weakness, in that their subjective judgments, involving not a right answer or a wrong one but a range of possibilities, will likely be swayed by institutional loyalties.<sup>193</sup> No specific adjustment on that account is identifiable, but the concern is one that can affect how discretion should be exercised in making other adjustments as to which the record suggests a range of options.

#### Demand Forecast and Utilization Factors

Determining the needed level of investment requires assessing the demand for service over a pertinent period and the utilization (or "fill") factor for the equipment, i.e., an "estimate of the proportion of [the] facility that will be 'filled' with network usage."<sup>194</sup> Verizon took account of "ultimate demand"; that is, it recognized growth over a ten-year period and assumed, for loop distribution plant, a utilization factor of 40%. (Ultimate demand is considered in the context of loop distribution plant, though the issue is not unique to it;

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<sup>192</sup> Reliance on the survey is not precluded by the hearsay rule. Such information is routinely used in our proceedings, as long as sufficiently knowledgeable witnesses are presented, and we are not, in any event, "bound by the technical rules of evidence." (Public Service Law §20(1).)

<sup>193</sup> To say this, I stress, is not to impute culpable conduct or even to call into question the legitimacy of the survey technique. It is simply to recognize a reality that must somehow be dealt with in using the survey results.

<sup>194</sup> Local Competition Order ¶682, cited at Verizon's Initial Brief, p. 14.



other utilization factors are discussed at the end of this section.) The CLECs argued, in general, that these assumptions require them to pay for capacity that they neither use nor need.

1. Distribution Fill Factor

WorldCom asserts a general mismatch, in the determination of per-unit loop costs, between a denominator reflecting current demand--in connection with which Verizon assertedly acknowledged that future demand was speculative--and a numerator based on ultimate demand, reflecting a network sized to meet current requirements as well as expected growth over the next ten years. WorldCom charges that Verizon presents its ultimate demand analysis as a theoretical discussion of the proper fill factor for copper distribution cable, in which it adjusts current demand levels upward to take account of the occupation of now-unoccupied housing units, the construction of new housing units, the conversion of single-family homes into multi-family units, the development of undeveloped land, and the conversion of other structures into housing units. These calculations produced a 40% fill factor for distribution cable, equivalent to 2.5 access lines per current residential customer, and MCI charges that this means that each time it purchases a loop from Verizon, it pays for 2.5 loops. It adds that even though it is paying for spare facilities, it is not allowed to use them, and thereby subsidizes the lines that Verizon uses to compete against it.

MCI contends further that the FCC rejected, in the Universal Service Proceeding, the use of ultimate demand to determine fill factors, citing both the speculative nature of the forecasts and the need for consistency between numerator and denominator and the unit cost calculation. Contending that Verizon never addressed in testimony the FCC's rejection of ultimate demand analysis, WorldCom finds incredible Verizon's witness's claimed ignorance of the FCC's action.<sup>195</sup> It

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<sup>195</sup> WorldCom's Initial Brief, p. 16.

characterizes as "deliberate distortion"<sup>196</sup> Verizon's argument that its 40% fill factor was the estimate of its networking engineering experts rather than the result of its ultimate demand analysis, noting Verizon's admission that the engineering experts at issue were not those surveyed in this proceeding but those involved in the previous proceeding's cost studies, where Verizon also proposed a 40% fill factor even though its field engineers had recommended fill factors of 70% to 80%. (The Commission in that proceeding adopted a distribution fill factor of 50%.<sup>197</sup>) WorldCom recommends adoption of the FCC's copper distribution cable fill of 75% for high density regions, such as Manhattan; it notes that the Michigan Commission recently adopted that figure. Lower factors, but in no event less than 55%, could be used in some less dense areas. Alternatively, WorldCom would have the Commission consider AT&T's alternative, next discussed.

AT&T criticizes Verizon's method on similar grounds, asserting that the method "require[s] CLECs to pay prices today for network facilities that will not be needed by anyone for another ten years."<sup>198</sup> It offers a number of specific criticisms of Verizon's growth assumptions, contending, among other things, that if actual growth and service characteristics of distribution areas were taken into account, utilization levels in mature neighborhoods could be set much higher than in other areas. AT&T suggests that Verizon's overstatement of needed capacity be corrected by taking Verizon's estimate of 4% annual growth and developing an adjustment factor for each asset account that will spread the annual costs over the average number of lines anticipated to use the asset over its expected life. It does so by computing the ratio of the present value of current demand plus growth lines over each projected asset life to the present value of current demand over that same time

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<sup>196</sup> Id., p. 17.

<sup>197</sup> Phase 1 Opinion, p. 65, Phase 1 Rehearing Opinion, pp. 41-45.

<sup>198</sup> AT&T's Initial Brief, p. 35 (emphasis in original).